

From taylorism to neo-taylorism: a 100 year journey in human resource management

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Frederick Winslow Taylor's "Principles of Scientific Management" revolutionized systems and techniques of personnel organization and management at the beginning of the 20th century when being published in 1911. This volume, as one of his three major works, is likely to be the best known contribution of the American mechanical engineer and economist.

The influence of Taylor's postulates was immediate in mass production both in the USA and around the world. Later on, in the last 100 years his principles have been applied, modified or reviled as well as they have given chance to different alternative schemes fitted to specific circumstances and market requirements, either aiming at their development or substitution.

This paper presents an overview of the main prevalent theories in personnel management from Taylorism up to current times, concluding that, far away of being an obsolete and exhausted model, several forms of Neo-Taylorism are nowadays fully in force in productive organizations.

Keywords: Taylor, Taylorism, Scientific Management, human resource, personnel management, historical evolution, Neo-Taylorism.

1. Introduction

Practices related to systems and techniques of personnel organization and management -albeit more or less consciously conducted- go back to the time when people began to consider the achievement of goals by working together. However, it was not until the beginning of the twentieth century, years after the Second Industrial Revolution was started, when the basis was settled to properly begin to talk about a real theory of organization and management of human resources (Vázquez–García 1999).

At that time, the industrial production shot up due to the access of a vast majority of individuals to consumer products in developed countries. Two examples of new products that quickly reached a massive consumer level were the aspirin (1899) and the vacuum cleaner (1908). Others, like sewing machines, typewriters, bicycles or cars were at the beginning accessible for a smaller number of consumers,

but after a while they turned into mass consumption when prices became more affordable as a result of their massive production.

Specifically, Daimler and Benz built their first automobile in Germany in 1885, but it was the Ford's popular and cheap "Model T" (1907) which revolutionized the automotive industry and not the expensive Rolls-Royce vehicles. In 1914, two million cars were circulating in the whole world, half of them in the USA. In a similar way, after the first airplane flight by the Wright brothers in 1903, both military and civil aviation were soon developed.

The spread of new industrial inventions became an unstoppable process. Complementing the fall in prices that was possible after the mass production of goods, sales by installments appeared to enable low income consumers to buy products of relatively high prices.

Mass and series production required a greater concentration of labor force in large manufacturing centers. Tasks were assigned to workers in the production lines, mostly fixed and repetitive. A typical example of this was Henry Ford's car manufacturing.

2. Frederick Winslow Taylor and his "principles of scientific management"

Frederick Winslow Taylor conceived and developed his theories and postulates in the above context. The famous American mechanical engineer and economist, promoter of the scientific reorganization of work tasks, and later known as the father of Scientific Management, was born in Germantown, Philadelphia (Pennsylvania) on March 20th, 1856.

Even as a child he began to lose his sight, and this, coupled with a weak physical constitution, prevented him from actively participating in games like baseball and tennis. Forced to be a mere observer, he devoted his first years of life to conceive ways of improving the performance of the players' physical effort through properly designing the game tools they used.

This attitude would mark him for life. Measuring efforts, locations and movements became his key objectives when collecting data in order to benefit from them with a maximum increase of efficiency, either in sports or later in production tasks. His biographers also described him as a person of uncompromising attitude against the rules of the game: "even a game of cricket appeared to him as a source of study and analysis" (Serra 1984, p. 9.).

In 1878 he made his first comments on work processes in the steel industry, followed by a series of analytical studies on workers' execution times and remuneration. His main contribution was to determine standard work procedures scientifically, leading to a mental revolution through a set of concepts which could

be deducted from his work published in 1903, entitled "Shop Management", one of his three major works along with "Principles of Scientific Management" (1911) and "Testimony before the Special House Committee" (1912), these two latter appeared shortly before his death on March 21st, 1915, at the age of 59¹.

The guiding principles of what was to be known as "Taylorism" were largely exposed in the second of these contributions. Specifically, Taylor suggested a separation and delimitation between the planning and management functions and task execution. He applied positivist scientific methods to study the relationships between workers and the modern techniques of industrial production in order to maximize the efficiency of labor force and the performance of machines and tools through a systematic subdivision of tasks into simpler ones, through the rational organization of work in its sequences and processes, through the elimination of unnecessary or redundant movements of workers and through the introduction of task timing in operations. He also urged the introduction of a system which motivated workers by paying them premiums on their performance and the elimination of all improvisation in the industrial activity.

The application of Taylor's postulates transformed the production systems in the industrial sector by: i) increasing the skills of workers through expertise and technical knowledge; ii) allowing a greater control of time in factories, which meant greater accumulation of capital; iii) introducing the initial idea of technical individualism and role mechanization; and iv) starting the scientific study of motions and productive time.

According to Taylor himself, the stages to operate his system of work organization were as follows:

1. Find ten to fifteen workers (if possible in different companies and regions) who were particularly adept at implementing a specific work process to be analyzed.
2. Define the exact series of elementary movements to be carried out by each of the workers to execute the work under analysis, as well as the tools and supplies used.
3. Determine with a chronometer the time required to perform each of the elementary movements and choose the simplest way of execution.
4. Remove all poorly designed, slow or useless movements.
5. Once all unnecessary movements have been eliminated, collect the fastest movements in a sequence allowing a better use of tools and supplies.

¹ These three main works were later grouped and published together in a single volume in 1947 under the title "Scientific Management".

To operate properly, Taylor's system required that workers were monitored by a special group of employees who were responsible for overseeing, organizing and directing the work. In addition, the production costs decreased not only due to the major levels in efficiency achieved, but also because many companies simultaneously decreased the wages paid for each piece to encourage workers to increase production.

As a consequence, by 1912 and 1913 numerous strikes had claimed against the use of Taylor's system, but this was not a real obstacle for its wider impact and implementation.

3. The immediate influence of Taylor's postulates

Diverse authors (e.g. George 1972) have analyzed the immediate influence of Taylor's postulates. Carl G. Barth, an early consultant on scientific management and later lecturer at Harvard University was not only influenced by Taylor's ideas but also helped him to develop speed-and-feed-calculating slide rules to a previously unknown level of usefulness.

At the same time, Henry Ford, founder of the Ford Motor Company, was one of the first entrepreneurs to apply Taylor's principles, pioneering the model of mass production in his Model T plant at Highland Park (Michigan, USA) in 1914. Ford's system was based on the fabrication of a large number of goods at low cost through chain production, thus offering cheaper products to the largest number of consumers. At a time when -as above mentioned- automobiles were reserved for a wealthy minority, the Ford Model T became one of the archetypes of such consumer-oriented products this way revolutionizing industry. Ford's system required improvements in the productivity of labor force and in efficiency levels when using specialized machinery (Taylor's scientific principles being ideal for this purpose) as well as a large number of line workers in factories. The development of this system would result in Fordism. Moreover, the interconnection between Taylor's and Ford's postulates is so obvious that a number of authors refer to Taylorism-Fordism as a single paradigm (e.g. Neffa 1998).

Other prominent Taylor's followers in the USA were Henry L. Gantt (the author of the chart that bears his name, a visual aid for scheduling tasks and displaying the flow of work), Frank and Lillian Gilbreth (the former developing motion studies in the building industry and the latter introducing Psychology into management studies), Harrington Emerson (applying scientific management principles in the railway industry), Morris Cooke (applying the same principles in educational and public -municipal- organizations), or Hugo Münsterberg (the promoter of the Industrial Psychology).

Harvard was one of the first American universities to offer a graduate degree in Business Management in 1908, basing its first-year curriculum on Taylor's Scientific Management. Taylor's principles were also specifically promoted by other prominent lecturers, as Harlow S. Person (Dean of Dartmouth's Amos Tuck School of Administration and Finance) or James O. McKinsey (Professor of Accounting at the University of Chicago).

In Canada (Rinehart 1975) the textile industry had already been re-organized according to Scientific Management principles by the early 1920s and workers also went on sound strikes against them some years later (as at the Canada Cotton Ltd. in Hamilton, Ontario, in 1928). Henry Gantt introduced the same principles when re-organizing the Canadian Pacific Railway.

On the other side of the Atlantic Ocean, Henry Le Chatelier introduced Scientific Management in government owned plants during World War I, but the most prominent follower of Taylorism was Henry Fayol, later known as the father of the Modern Theory of Administration. Fayol's principles (fourteen, against the five by Taylor) would grant a kind of "adulthood" to the then new discipline. Soon widely spread and well-known, these principles were related to the division of work, authority, and discipline, the unity of command, the subordination of individual interest to the general interest, remuneration, centralization, scalar chain, order, and equity (Fayol 1949).

In Switzerland, the American Edward Albert Filene established the International Management Institute to spread information about management techniques, being highly influenced by Taylor's postulates, just as Vladimir Lenin in the Soviet Union.

Lenin, together with Joseph Stalin incorporated Taylorism into Soviet mass production manufacturing. However, some authors state that Taylor's methods had never really taken root in the Soviet Union (Atta 1986), as the stop-and-go of the production process -workers having nothing to do at the beginning of a month and "storming" during illegal extra shifts at the end of the month- and the voluntaristic approach of the Stakhanovite movement of setting individual records was diametrically opposed to Taylor's systematic approach, and proved to be even counter-productive and had nothing to do with the successfully taylorized plants (Head 2005).

4. Evolution of Taylor's postulates and alternative approaches (post-Taylorism)

Later on, Taylor's principles have been applied, modified or reviled in different ways, then giving chance to alternative approaches fitted to specific circumstances and market requirements, either aiming at their development or substitution. This

section presents an overview on the main developments on personnel management during the last one hundred years.

4.1. Theory X and Theory Y in human resource management

Following this overview in time, Theory X and Theory Y in personnel management constitute a compulsory reference. Specifically, the first of them appeared when Douglas McGregor intended to name his assumptions on "traditional" approaches related to human nature -in a general sense- and specifically to the nature of workers (McGregor 1960). To be precise, he chose the term "X" as preferring a "neutral" terminology to characterize and define such principles, thus avoiding other terms that could have negative or pejorative connotations (as "old", "bad", "rigid" or "antiquated").

Theory X principles could be summarized in three as follows (Koontz–Wehrich 1994):

1. People, as a general rule, will experience an inherent rejection feeling towards work and, if possible, they will avoid it.
2. Because of the inherent aversion to work, managing that a majority of people devote an adequate effort to achieve group or organizational goals will only be possible through using some kind of coercive method to force them to do it.
3. Also consistent with this aversion to work, people usually prefer to be managed and to be told what they "should" do, thus avoiding responsibility and leaving aside any free and spontaneous initiative. They have relatively little ambition and, above all, they want security.

So, according to McGregor, the postulates in the Theory X frame represented the "old", "antiquate" or "obsolete" face in human resource management, all within a context of rigid, static and markedly pessimistic work. The "struggle" between those who "order" and those who "obey" goes around the antithesis of interest "maximization of benefit" vs. "minimization of effort".

In contrast with Theory X postulates, McGregor himself suggested a new set of postulates to characterize what he called Theory Y. This was also a "neutral" terminology (if compared to alternatives as "new", "good", "flexible" or "up-to-date"), now to clearly define what he considered positive or laudable principles characterizing "new", "current" (obviously, at that time) and "successful" approaches in practices dealing with human resource management and administration.

In this case, the working context appears as dynamic, flexible and optimistic, clearly stressing the desirability of having motivated and satisfied workers at disposal and encouraging self-control and free initiative (within limits).

Theory Y principles could be summarized in the following six (Koontz–Wehrich 1994):

1. Realizing an effort to perform a work (whether physical or mental) is as "natural" to people as eating, drinking or resting.
2. In contrast with external control or the threat of punishment or other coercive ways to force workers to fulfill the tasks that are assigned to them (as proper of previous systems and approaches), self-management and self-control appear as the most effective ways to get them involved in the achievement of the goals with which they are committed.
3. The degree or the level of commitment that each individual has regarding the intended goals is directly proportional to his/her motivation and the incentive associated to its achievement.
4. In case of adequate conditions and circumstances, people usually do not only accept but even try to take some level of responsibility.
5. Also as a general rule, imagination and creativity in solving situations or facing problems are qualities which are widely present in most people. The real question deals with knowing the procedures to allow a successful implementation of workers' imaginative and creative potential in solving the problems in organizations.
6. Finally, and consistent to the fifth principle, given the conditions and circumstances of "modern industrial life" (once again as it was considered to be in the years of McGregors' contributions, i.e. the 50s and 60s), the intellectual abilities and possibilities of the average worker were not used in most cases and organizations, but in a sporadic and partial way.

Even when it might be seen otherwise, Theory X and Theory Y were not considered as a sequential process over time, or the former has to precede the latest in the management approaches at each and every organization. McGregor was already aware of this potential misinterpretation of his theories and tried to avoid it by using a terminology as "neutral" as possible. Moreover, in McGregor's words, his postulates are just mere assumptions on the generality of prevailing systems in human resource management, requiring an empirical contrast in the reality of every organization. In fact, they are two significantly different views, but what is not so clear is whether Theory Y is to perform more efficiently than Theory X in each and

every organization or under each and every circumstance surrounding their productive activity.

Consequently, most "effective" organizations and managers will be those able to make a correct analysis and diagnosis on the situation, then applying the most appropriate management techniques and procedures to successfully solve the problems they face in achieving the intended goals.

4.2. Toyotism

While in the 50s the abundance of workforce in Western countries allowed the development of mass production and consumption, the situation in Japan after the big World War was pretty different, thus leading to the transformation of Taylorism with quite different parameters. A new working system was developed aiming at the maximization of efficiency in mass production which would be known as Toyotism, as mainly attributed to Toyota's founder, Sakichi Toyoda, together with his son Kiichiro Toyoda and the engineer Taiichi Ohno. This alternative system was due to the concrete need of producing relatively small quantities of many products, so being designed to be very flexible and to face difficult diversification circumstances (Coriat 1995) by increasing productivity through effective management and combined work, a step forward from mechanization and individualism that characterize Taylorist and Fordist processes. The main guiding points of Toyotism are as follows:

- Job flexibility and high rotation in roles and tasks.
- Promotion of teamwork and integration (identification) among individuals at different hierarchical levels.
- Just-in-time, valuating the relationship between production time and product flow under a logic consisting of less control on the worker in the production chain and speeding the demand, which brings to a situation of "zero stock" and allows a reduction in storage costs. Orders (demand) start the production, not an offer with no guarantee of market acceptance.
- Reduction of plant cost, which can be transferred to the consumer as lower prices, this way progressively increasing consumption.

The efficiency of Toyotism derives from the application of the so-called "five zeros" strategy: zero defects, zero breakdowns, zero delays, zero paper (reduction of bureaucracy) and zero inventory (stock minimization). This way it is possible to produce highly differentiated products in small quantities (in contrast with mass production characterizing Taylorism-Fordism). Organizations have small multifunctional staffs,

they adapt their production to current demand and introduce mechanisms for an automatic shutdown of faulty machines (thus avoiding waste of materials and failures).

4.3. Theory Z and modern personnel management

Some years later (in the 70s and 80s) the first postulates of what later would be called Theory Z appeared in personnel management (now this terminology considered as preferable to that of "human resource"). The origin of this new approach lies in different contributions by several Japanese authors (as Ouchi 1981, Amako 1982), consistent with practice in a country that, even when one of the most developed worldwide, has been traditionally used to do things quite different (not so much in the background, but clearly in form) from procedures at organizations in economically advanced Western countries.

In this case it is highly difficult to consider an author as father of Theory Z (just as McGregor is considered the father of Theory X and Theory Y). However, a set of common reference points to all in-origin contributions can be determined. Specifically, we could refer to two main starting points, which are proper of Eastern culture and way of thinking:

Firstly, the idea of providing a "job for life" to the permanent employees within an organization is in the core of the philosophy of Theory Z. Related to it, there is a need to integrate and motivate people towards achieving group goals, to which individual and personal interests are subordinated. This practice contributes to the organization applying the concept of "harmony" known to the Eastern philosophical approaches, this way increasing the levels of loyalty and commitment of employees while allowing respect to age or, in this case, to seniority in jobs, also as a generally accepted principle.

Secondly, and in some way contradictory to the above idea on respect for hierarchy and seniority, the habit of making decisions through obtaining a consensus among all actors involved in every situation. Despite the "logic" or usefulness of using a decision-making system based on respect towards who is considered as qualified to make them, the real truth is that Japanese practices even put consensus before any possible pressure in time terms. Decisions made on the basis of a common point summarizing all views and potential differences in opinion of those who will be responsible in one or another way for implementing the resolutions adopted are considered as highly convenient or even as a requirement.

Performing accordingly to this reasoning, higher levels of commitment in all involved workers are assured, regardless of their specific tasks or positions in hierarchical scales. Such philosophy or way to perform has resulted in a number of specific names in decision-making models as, for example, the Ringi model (Amako

1982) which is applied, among other possibilities, to assess and select ideas for innovation processes.

However, and even when the initial basements were previously established, Theory Z did not become part of academic or managers' language until the economic expansion in Japan was experienced as a reality. Then, problems when directly trying to apply Eastern principles in other countries and cultures could be observed, and subsequently the need to adapt them to practices in Western organizations (or more specifically in the USA) was advocated.

So we could say that Theory Z is not a single proposal but a compendium of practices and experiences resulting from the expansion of specific Japanese companies in the Western context due to the need to adapt their operational methods to the new environmental circumstances. Among the major common postulates guiding these new forms of personnel management we could refer to (Ouchi 1981):

- An emphasis on encouraging the interpersonal skills that are required to achieve interaction and accomplishment of objectives within the group.
- Development of decision-making processes based on consensus, thus seeking for a greater engagement of all involved individuals.
- Assignment and elucidation of individual responsibilities (a clear evidence of the adaptation experienced by Japanese practices, since in this country determination of collective responsibilities is very usual to the encouragement of group spirit).
- Promotion of informal relationships based on mutual trust, either within or outside the workplace.
- Application of participative management systems, at any case maintaining hierarchical structures and the principles of authority and discipline (which is another clear sample of the adaption of Eastern practices to the Western environment).

In summary, we could say that those organizations that apply Theory Z principles and postulates are in fact selectively using personnel management practices of Japanese organizations after a previous process to adapt them to the Western cultural environment. Thus, and for example, we could also state that participative management either allows or encourages the free flow of the information that is needed to make decisions in a consensus atmosphere, in order to properly develop planning processes where formal aspects and establishment of goals are important, but qualitative issues are put before numerical and quantitative considerations.

Corporate philosophy and values will be in charge of guiding and directing the personnel management practices, but here a comprehensive approach to those working in organizations is advocated and encouraged in contrast to the potential risk of a hypothetical loss of personal identity of the individual in favor of corporate identity. Workers are considered as being in possession of an immense imaginative and creative potential, which could be exploited in the pursuit of collective goals according to an approach far away from outdated reductionist identification of workers as merely another productive factor.

4.4. Hybrid forms of Toyotism (*Lean Manufacturing*)

In just two decades, Japan became a world industrial leader country in the early 70s by applying the principles of Toyotism (also used in other countries in the area, as Korea) which displaced Taylorism-Fordism as reference for mass production.

Simultaneously, some hybrid forms of Toyotism were developed in other countries, sharing the common aim of reducing costs and social stimulus to workers. This is the case of Lean Production, a widespread system in Western automobile industry in the 90s (Womack–Jones 2003) coming from a management philosophy focused on obtaining right things at right place, at right time and in the right quantity while minimizing waste and being flexible and open to change. The underlying logic is specifically adapted to a hypercompetitive society, in which the diversity of tastes becomes a main focus factor and seven types of "wastes" -or *mudas*- should be reduced (overproduction, waiting time, transportation, over processing, inventory, motion and defects) in manufactured products. Through eliminating resource waste, the quality is improved and production time and costs are reduced. This implies non-stop processes of analysis (*kaizen*), pull production (*kanban*) and fail safing (*poka yoke*). The key principles of Lean Manufacturing or Lean Production are:

- Perfect quality at the first attempt: aiming zero defects and detection and resolution of problems at source.
- Waste minimization: removing all activities which are not adding value, establishing safety nets and making an optimal use of scarce productive resources (financial, human and systems).
- Continuous improvement: reducing costs, improving quality, increasing productivity and sharing information.
- Pull processes: products are requested by clients, not offered by pushing on demand.
- Flexibility: aiming quick production of a range of products without efficiency losses due to lower production volumes.

- Long term relationships with suppliers: setting stable agreements in time to share risks, costs and information.

4.5. Internal marketing as a step forward in personnel management

As influenced by the evolution of economic, social, labor, legal, demographic and any other environmental circumstances, personnel management methods and strategies should be adapted to increasingly competitive environments, thus leading to discussion on the desirability of designing and implementing new models in accordance with requirements at any time. The new system, perceived as a step forward when compared to Theory Z was internal marketing.

On the basis of pioneer conceptual attempts in academic literature (Arndt 1983, Grönroos 1984, Levionnois 1987), this marketing branch, located halfway between the departmental functions of marketing and human resource management, and using similar tools to those of its external counterpart, aims at motivating all people in the staff or working somehow with the organization, thus guiding them to accomplish the broad objective of profitability and subsistence in the market. Internal marketing focuses on personnel management and considers employees as part of a target market to be analyzed, segmented and offered an adequate and attractive product, transcending and going beyond a mere job and a wage to fulfill as much as possible individuals' desires for self-realization, while achieving higher performance and integration levels according to the philosophy and objectives in the organization (Vázquez-García 1999).

It has even been suggested that application of internal marketing principles becomes essential to a priori increase in the potential for success of external marketing programs, since previous staff's satisfaction or dissatisfaction comes into obvious positive or negative feedback effects (as appropriate) which may be reflected on one or multiple aspects when implementing external marketing measures, such as service quality and customer care, credibility of entrusted tasks, etc. just to name a few examples.

As for any other marketing branch, different operational policies ("Ps") could be determined in the case of internal marketing. To be precise, the "product" was implicitly defined when determining the internal marketing concept. The "price" could be considered as the "payment" or compensation from "customers" (here employees) in return for the product they receive, and consequently measured in terms of the work or labor services they render to the organization. The concepts of "place" and "promotion" ("communication") in internal marketing are even easier to be specified by analogy with the external marketing, the latter being which has reached a higher level of development so much so that sometimes the term "internal communication" is used as a synonym for "internal marketing".

On the other hand, internal communication should not be restricted to the channel used to get the staff informed (unidirectionally) but it should be conceived as a real management tool reaching all functional areas and departments through relevant procedures for interactive dialogue (and therefore bidirectional) and finally succeed in integrating human teams, involving individuals in common organizational goals and motivating them to their accomplishment (Langarica 1995). What is more, the implementation of an effective and appropriate internal communication system usually brings quick profits once a favorable working environment is achieved, while its absence, on the contrary, usually implies dysfunctions either among different hierarchical levels or among elements located at the same level (Vázquez 1998).

However, highlighting that internal marketing is much more than only internal communication, one might say that three are the main areas of impact or "sensitive" areas in the organization which, after being affected, should be adapted to the new trends in human resource assessment and management (Barranco 1993):

1. Labor relationships should be reoriented towards a new style, considering workers as people with a virtually unlimited creative potential which the organization could take advantage of, and not as only a "human resource" to be optimized through guided exploitation without any margin for personal initiative or freedom of action. The new approach appears as much more qualitative than quantitative.
2. Organizational structures should increase their adaption possibilities to changing needs in markets, which in most cases will imply suppressing essentially rigid and hierarchical systems for the higher levels of flexibility achieved by moving responsibilities closer to operational positions at the basis of the pyramid of command.
3. Management systems (taking the concept in a general sense and specifically when related to the personnel area) should also be readapted to stimulate the participation of each and every member of the staff through the adequate design and implementation of those incentives which appear as most appropriate at any time to encourage the initiative of the whole organizational group.

On this last point, the references to remuneration and incentive systems would also deserve further consideration and analysis. In summary, closed payment systems structured on predefined elements must evolve to more open and flexible models aiming at the motivation and integration of the staff members through the combination of wages with other factors, also positively valued by people, such as

recognition (congratulations on a well-done job or positive initiatives), stability (chance to remain in the job for those who have performed accordingly to expectations), safety (dealing with the implementation of sanitary and labor risk prevention measures as required and appropriate) and training (either as abilities for a proper performance at the time of recruitment or as recycling opportunities to continue successful performing).

Additionally, we should also remember that internal marketing approaches are dynamic and, far away to come to a standstill focusing in solving troubles at a concrete time, they are characterized by being involved in a non-stop evolution contributing to new and creative solutions at any time based on the changes in the environment for their application field. As a concrete example of such evolution, we could refer to the recent and increasing inclusion among internal marketing principles of some new issues dealing with job training, safety and stability, some of them mentioned in the previous paragraph.

5. The circle closes: new forms of Taylorism (Neo-Taylorism)

The above discussed Post-Taylorist schemes were developed simultaneously to technological changes allowing an increasing flexibility in organizational structures and a greater integration with suppliers, distributors and clients, while the availability of qualified workforce has gradually increased.

Thus, according to some authors (e.g. Jürgens et al. 1993), Taylor's model could be considered as exhausted by the 60s or 70s, specifically in developed countries. However, reality is quite different: chain work remains and there are also other possibilities.

5.1. Digital Taylorism

More recently, the phenomenon of globalization has significantly contributed to new market conditions that have changed working schemes in productive organizations. Market requirements are more and more focused on aspects dealing with quality, flexibility, leading to time reduction and satisfaction of an increasing diversity of clients and tastes.

To face this new context, organizations are not following a single direction. An example of the new approaches is Digital Taylorism, a system based on the global organization of the "knowledge work" that characterizes the information or third industrial revolution (Brown et al. 2011). The main hypothesis is that even when new jobs are much more related to workers' qualifications and abilities, tasks are subject to the same scientific management

processes that craft and chain work experienced once in time when reconsidered under the original principles of Taylorism.

Under the postulates of Digital Taylorism, creative and intellectual tasks - until recently considered as non-machinable- are subject to the same process as chain work. Once they have been codified and digitalized, the human capacity for decision and judgment can be replaced by automatic programs with computerized decision protocols. As processes can be easily relocated due to technical mobility possibilities -as proper of computerized global connections- jobs are easy to export, change or replace.

The effects of Digital Taylorism are more visible in developed countries as computerized tasks are increasing day by day there, while in developing and underdeveloped countries wages remain at lower levels.

5.2. Other forms of Neo-Taylorism

Some other approaches dealing with Taylor's principles may appear as not so obvious or systematically applied, but they are as much or more effective in their results. Thus, within a generic category of "other forms of Neo-Taylorism", we could refer to a number of practices in organizations aiming at the reduction of time and resources in productive processes through maximization of efficiency, the basic principles that constituted the starting point to develop Taylor's postulates.

Among these practices, the aim of increasing value in customer service through reducing waiting time has led to single-queuing systems² not only in customs, passport control or security access systems, but also in all other organizations which could experience a number of customers at a time. As a clear example, it is not rare at all entering a single-queue to pay in large supermarkets or hypermarkets, allowing not only to reduce waiting time to customers (which not always are fully convinced of the benefits of the new system) but simultaneously to decrease the number of staff workers in cash line and their idle time virtually to zero.

Another example of Neo-Taylorism deals with the extension of "effective" working time beyond the "formal" working hours, not only through overtime but involving workers in issues related to the organization up to 24 hours a day. The origins of these practices are also in Japanese culture (e.g. arranging collective activities for employees during weekends or encouraging development of teamwork projects after working hours).

² Queuing theories are not new at all in organizational literatures. What is more, different authors have been considering for years the usefulness of single queues (see, e.g., Gelenbe-Pujolle 1976).

However, one of the most well-known cases applying this philosophy is the Internet giant Google. Together with high wages, the company provides its employees all sorts of "extra benefits", such as corporate transport, breakfast, lunch or dinner facilities, gyms and a wide range of activities for relaxation and leisure. At the first sight this can be perceived as a "maximum development" of the principles of internal marketing (up to the extent that Google occupies year after year top leading positions in the rankings of "most desired companies" when seeking for a job³), but it may be also interpreted as the overexploitation of the imaginative and creative potential of a highly qualified personnel (thus dealing with Digital Taylorism) whose lives take place almost entirely in the working place and its immediate surroundings, day and night sharing talks, comments, activities and experiences with colleagues in a very restricted affective circle where everything is related to the company, its projects and problems.

Although economic conditions may be attractive and perception on other incentives may be favorable, the reality is that employees devote in one way or another 24 hours a day, 7 days a week and 365 days a year to the organization.

6. Conclusions

The main purpose of Frederick Winslow Taylor's postulates, faithfully reflected in his "Scientific Management" principles, was to maximize efficiency in manufacturing processes –specifically chain work and mass production– conceived as maximum return at minimum cost. For this purpose, he conducted a systematic process of task division, time and motion study as well as a review on productive models and methods in connection with the performance of the unskilled labor force that was prevalent in factories in the early 20th century.

Taylor's principles were immediately applied in the USA and Canada, specifically in the automotive industry to produce the Ford Model T, up to the extent of referring to Taylorism-Fordism as a single paradigm. This same influence quickly spread to other industries and countries at both sides of the Atlantic Ocean.

Later on, changes in market circumstances and requirements have been reflected in application, modification or substitution of Scientific Management principles, thus giving chance to new models or theories in personnel management, such as Theory X, Theory Y, Theory Z or internal marketing. Simultaneously and parallel to Theory Z, Toyotism was developed in Japan in the 50s as an alternative

³ Appearing in the fourth position in 2011 (CNNMoney 2011).

scheme in mass production and evolved into Lean Manufacturing and other hybrid forms in Western countries.

However, and far away of being considered an obsolete or exhausted model, new forms of Neo-Taylorism remain fully in force up to current times in productive organizations, even nowadays in a highly globalized and technologically developed environment. That is the case of Digital Taylorism or other forms of Neo-Taylorism in connection with customer service or the overexploitation of the imaginative and creative potential of highly qualified employees appearing as an attractive internal marketing offer.

Therefore, we could not conclude but Taylor's principles remain fully in force. Of course, we are not specifically or only talking about their application in assembly lines or work chains, but about the usefulness and validity of general statements dealing with the maximization of efficiency through reduction of time and resources in production (something also closely related to current positions regarding sustainability of productive activity).

We can expect new forms of Taylorism to be developed and applied based on and compatible with social progress in labor sphere. One hundred years after the publication of his *Principles of Scientific Management*, Taylor's assumptions are nowadays entirely valid in current socioeconomic context.

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